



**PRESBY ENVIRONMENTAL, INC.**

800-473-5298

www.presbyenvironmental.com

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## TECHNICAL BULLETIN

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**\*\*\* U R G E N T \*\*\***

### **INDIANA TRAINING UPDATE December 2009 PREVENTING EXCESS HYDRAULIC LOADING**

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**Abstract:** *The performance and longevity of any onsite wastewater treatment system can be adversely affected by regular, sustained hydraulic loading in excess of daily design flow. Discussed below are certain design and installation techniques which can prevent onsite systems from being flooded by surface and/or ground water flows. Saturated conditions are detrimental to the function of the Enviro-Septic® System, which relies on aerobic conditions to perform optimally.*

**Background:** During recent inspections of Enviro-Septic® Systems in Indiana, a pattern of common installation errors became apparent. While these errors would be detrimental to **any** onsite system's function, this Technical Bulletin will focus on how these factors impact Enviro-Septic® Systems and how such problems can be corrected and/or avoided in future installations. Onsite systems are sized based on the expected amount of effluent they will treat on a daily basis, which is referred to as "daily design flow." It is important to ensure that each system is adequately sized, taking into consideration the actual number of occupants (if this increases flows beyond the daily design flow) and whether the system will be subjected to additional loading from jetted tubs, water softeners, water purifiers, etc. The volumes of water utilized by such fixtures and appliances should be included in design daily flow calculations in order to size a system properly. Onsite systems are not designed to handle additional water from roof drains, foundation drains, sump pumps, irrigations systems, gutter systems, etc. Since the water from such systems does not require treatment, it can be safely dispersed in a location where it will not impact the onsite system.

**Common Causes of Excessive Hydraulic Loading:** While an onsite system can easily handle isolated, occasional surges in volume either of effluent or storm water runoff, prolonged dosing in excess of what the system was designed to handle can be problematic. Some of the more common sources of excess hydraulic loading discovered were the result of drain or gutter systems discharging into or near the treatment field, inadequate perimeter drains, ineffective surface diversion/swale installations, and leaking septic tank connections. Recent inspections of Enviro-Septic® systems in Daviess County by the Daviess County Health Department, ISDH, Presby Environmental and Environmental Septic Solutions revealed that these were the most common installation errors contributing to hydraulic overloading of onsite systems.

Also, leaks in the plumbing system can also result in overloading the onsite system and should be repaired immediately. Care should also be taken to ensure that the septic tank and all of its connections, access ports, risers, etc. are properly sealed and watertight to prevent ground water from infiltrating and overburdening the system.

**Lowering Ground Water with Perimeter Drains:** For Indiana sites where the seasonal high water table ("SHWT") is too close to the surface, a perimeter drain can be used to lower the SHWT. **NOTE: It is preferable in such situations to design an elevated system rather than attempt to lower the SHWT with a drain.** However, there are times when even an elevated system may require a perimeter drain to lower the SHWT. In all cases where a perimeter drain is required, it is crucial that the drain be located and constructed properly. Please see attached Perimeter Drain Notes. A properly constructed perimeter drain surrounds the system on all four

sides and is a minimum of 10 ft. away from the outer edges of the System Sand bed. Ongoing maintenance by the owner to ensure that the outlet remains unobstructed is **essential** to proper functioning; animal guards are required on the drain outlet to prevent animal activity that could result in obstruction. No other drainage systems (such as foundation drains, sump pumps, etc.) should be incorporated into the perimeter drain design or discharge in the area of the onsite system.

**Redirecting Surface Water Flows with Diversions and Proper Grading:** In selecting the location of the onsite system, it is important to consider the surrounding topography and select a site where surface and subsurface waters do not naturally converge. Adequate soil cover material (loam/topsoil, minimum of 6 in. deep) must be installed above the System Sand; this cover material should be “crowned” to direct surface waters away from the system. Crowning is a very simple procedure: simply make the center of the system area the “high” point and grade the cover material so it gently slopes away from the center; keep in mind there will be some natural settling of cover material. We have found that poor final grading, or using less than the required amount of soil cover above a system, results in “pockets” which hold surface water, allowing it to infiltrate the system and possibly cause saturation. After final grading, the site must be seeded and mulched or sodded immediately to prevent erosion; only shallow-rooted vegetation such as grass or wildflowers should be planted above an onsite system. There should be no trees or gardens planted within ten (10) feet of the system; the State of Indiana does not permit “hardscape” (paving, patios, driveways, parking lots, etc.) to be installed above the system.

Swales are another means of directing surface water away from the system. Swales are installed in undisturbed soil in order to intercept and divert surface water flows away from the system. They should be located a minimum of 10 ft. from the outer edge of the System Sand bed (if a perimeter drain is used, the swale is located above or immediately upslope from the perimeter drain area). Swales must have a positive grade of at least 0.2 feet per 100 feet to prevent standing water. Swales should be sufficiently deep to redirect surface water away from the treatment field effectively. (Please see attached Perimeter Drain Notes.) It is also important to explain the purpose of swales to the system owner so they will not alter them or backfill them. The Monroe County Indiana Health Department recently issued a directive making swales mandatory if a perimeter drain is used. They also stressed the importance of explaining the purpose of swales to the system owner, since in many cases properly installed swales are filled in by homeowners or landscapers who do not understand how critical these surface diversions are to the onsite system's function.

**Conclusion:** Proper site selection, accurate sizing, adequate perimeter drains, and well-constructed surface diversions (grading and swales) are effective in preventing excess hydraulic loading to onsite systems. Prolonged saturated conditions compromise the function of all onsite systems and measures should be taken to redirect ground and surface water away from the treatment field. Homeowners should be made aware of the importance of dispersing water other than wastewater away from the onsite system. If you have any questions about the information in this Training Update, please contact Presby Environmental or Environmental Septic Solutions for technical assistance and further guidance.

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# Enviro-Septic® Wastewater Treatment System DESIGN CRITERIA WORKSHEET

Manufactured by Presby Environmental, Inc. (800) 473-5298

Distributed in Indiana exclusively by Environmental Septic Solutions, Inc. (812) 457-3144

<b>DESIGNED BY:</b>		<b>INSTALLED BY:</b>	
Name: Company: Address: Telephone: PEI Cert. #		Name: Company: Address: Telephone: PEI Cert. #	
<b>SYSTEM OWNER(S):</b>		<b>SITE IDENTIFICATION:</b>	
Name: Address: Telephone:		Address: Town: Map/Lot: Permit #: County:	
<b>Note: Presby Environmental, Inc. and Environmental Septic Solutions, Inc. strongly recommend the completion of these worksheets for all system designs to assure proper design criteria are utilized. Completed documentation to be retained by Designer, with copies provided to the Installer, system owner and the local health officer.</b>			
<b>Instructions to Designer: Complete all white sections by filling in blanks or circling</b>			
<b>Soil Class</b> (circle one)	<b>A*    B    C    D    E    F    G</b> <i>*installations in A soils req. ISDH approval</i>		Attach Site/Soil Evaluation Report. Refer to Soil Class Chart in manual.
<b>Number of Bedrooms</b> (determines system size)	Sizing charts assume 150 gallons per day per bedroom # of bedrooms x 150 gallons per day = Daily Design Flow (Add 1 bedroom for each jetted tub 125 gal.+ capacity)		_____ # Bedrooms x 150 gpd = _____ <b>Daily Design Flow</b>
<b>Required Minimum Separation Distance to SHWT or Limiting Layer</b> (circle 24 in. or 30 in.)	<b>24 INCHES</b> <b>30 INCHES</b> (Design Flow <450 gpd)      (Design Flow ≥ 450 gpd PER BED)                      PER BED) <b>Note: It is acceptable to divide flows greater than or equal to 450 gpd into multiple beds in order to use 24 in. separation distance.</b>		Measured from the infiltrative surface (sand bed bottom/soil interface).
<b>Vertical Orientation of System</b> (circle one)	<b>SUBSURFACE</b> <b>ELEVATED</b> (infiltrative surface 4 in.      (infiltrative surface < 4 in. or more below orig. grade)      below original grade)		It is <i>always</i> preferable to raise the bed when a SHWT is encountered; however, a perimeter drain may still be required.
<b>Type of System</b> (circle one)	<b>GRAVITY FED</b> <b>FLOOD DOSED</b>		Flood dose frequency: minimum=design flow ÷ 6 Maximum design flow ÷ 8 (per day)
<b>Configuration</b> (circle one)	<b>BASIC SERIAL</b> <b>COMBINATION</b> <b>NON-CONVENTIONAL</b> (req'd. E-G soils)                      (A-D soils only)		
<b>Site Slope/System Slope</b>	<b>LEVEL (0-1/2%)</b> <b>SLOPING</b> _____ %		6% max. slope for elevated systems 15% max. slope for subsurface systems
<b>Depth to Limiting Layer</b>	_____ inches	<b>Depth to SHWT</b>	_____ ft.
<b>Perimeter Drain included?</b> (req'd. if SHWT is less than 24 in. from infiltrative surface)	<b>YES      NO</b> (circle one)	<b>Dispersal Area Width</b> (req'd. in E, F, G soils) <i>Note: No structures permitted in this area.</i>	_____ ft. (Min. 10 ft., Max. 25 ft.)
<b>Minimum Drain Depth</b>	_____ in.	<b>Bed Bottom at highest elevation of orig. grade</b>	_____ in. below grade.
<b>High Vent from d-box?</b>	<b>YES      NO</b> (circle one)	Flood dosed: High vent off d-box is req'd. Gravity: House (roof) vent is the high vent; no vent off d-box. <b>Low vent req'd. for ALL systems.</b> Note: 10 ft. min. differential btwn. High and Low vent inlets.	

ENVIRO-SEPTIC® DESIGN CRITERIA WORKSHEET, page 2		
Distribution Box included?	<div>YES</div> <div>NO</div> <div>(circle one)</div>	D-box to be installed on stable, compacted base. Insulate d-box in pumped systems to prevent freezing. Flow equalizers req'd. if dividing flow to multiple sections or beds.
Minimum Enviro-Septic® pipe required	_____ FT. OF ENVIRO-SEPTIC® PIPE REQ'D. (From Table A for A-D soils or Table D for E-G soils)	Amount of pipe req'd. is based on the # of bedrooms.
Minimum Row (Line) Length (Maximum row length is 100 ft.)	_____ FT. MINIMUM ROW (LINE) LENGTH (A&B soils 30 ft., C soils 40 ft., D soils 50 ft. See Table D for minimum row/line lengths in E-G soils. If result is greater than 100 ft., multiple beds are req'd.)	Ideal system shape is as long & narrow as the site will allow. All rows (lines) w/in a bed must be equal in length in E-G soils.
Total Number of Rows (Lines)	_____ FT. PIPE REQ'D. ÷ MIN. ROW LENGTH _____ = _____ MIN. NUMBER OF ROWS (Round UP if result is not a whole number) (Refer to Table C for A-D soils or Table D for E-G soils)	All systems/beds require a minimum of 2 rows (lines). Easiest to work with 10 ft. increments.
Determine System Sand bed length	_____ FT. MIN. + 2 FT. = _____ FT. SYSTEM SAND ROW LENGTH BED LENGTH	Bed length is always 2 ft. more than min. row (line) length.
Determine System Sand bed width	E-G Soils: Refer to Table D, BED WIDTH IS _____ FT.  A-D Soils: Refer to Table C: _____ FT. SYSTEM + 2 FT. = _____ FT. SYSTEM WIDTH SAND BED WIDTH	System Sand always extends 1 ft. horizontally beyond pipe ends.
Determine Center- to-Center Spacing	E-G Soils: SPACING IS FIXED AT 1.5 FT.  A-D Soils: Refer to Table B, SPACING IS _____ FT. (minimum spacing varies by soil class & slope)	Distance from the center of one row to the center of the adjacent row.
Determine if Multiple Beds are required (Note: each bed must receive an equal amount of effluent. Total ft. of pipe in each bed can vary if necessary due to soil class variations)	Multiple beds can be used to accommodate site constraints. Bed loading limit is 750 gpd; divide daily design flow by 750 to determine number of beds. Multiple beds req'd in E-G soils if Minimum Line Length exceeds 100 ft. It is acceptable to divide flows greater than 450 gpd into multiple beds in order to use 24 in. req'd. separation distance rather than 30 in.	<div>YES</div> <div>NO</div> <div>(circle one)</div>  If "Yes": _____ # of Beds Req'd.
If Multiple Beds are required, determine layout	<div>END-TO-END</div> <div>SIDE-TO-SIDE</div> <div>(circle one)</div>  Note: End-to-End configurations are preferred	End-to-End beds separated by a min. of 4ft. undisturbed soil. Side-to-Side beds separated by a minimum of 20 ft.
Determine depth of System Sand req'd. below pipes	<div>12 INCHES</div> <div>6 INCHES</div> <div>(if elevated) (if subsurface)</div> <div>(circle one) </div>	Elevated systems require an additional 6 in. of System Sand below the pipes.
PROPOSED SYSTEM SUMMARY OF DESIGN CRITERIA :		
DESIGN CRITERIA:	REQUIRED MINIMUM	ACTUAL PROVIDED IN DESIGN
Total Enviro-Septic® Pipe (in ft.)	_____ FT.	_____ FT.
Row (Line) Lengths	_____ FT.	_____ FT.
Numbers of Rows (Lines)	_____	_____
Center-to-Center Spacing	_____ FT.	_____ FT.
Number of Beds	_____	_____
By signing below, Designer confirms dimensions have been written in on the appropriate (one) cross section on the attached page and a copy of the plan or a sketch of the plan is attached to this worksheet. Designer further confirms that a copy of the completed worksheet has been provided to the installer, system owner, and local health officer.		

Signed: \_\_\_\_\_ Dated: \_\_\_\_\_  
(Print Name Here: \_\_\_\_\_) PEI Cert. #: \_\_\_\_\_

In the space below, sketch the Enviro-Septic® System design, including references to structures or other benchmarks to indicate system location on the site. Indicate “As Built” changes. Retain a copy with system documentation and provide a copy to the System Owner.

Site Address: \_\_\_\_\_ System Owner(s): \_\_\_\_\_  
 Installer's Name: \_\_\_\_\_ Date of Installation: \_\_\_\_\_

[illegible]

\* NOT TO SCALE UNLESS NOTED\*

### Enviro-Septic® Wastewater Treatment System - Indiana Installation Checklist

Manufactured by Presby Environmental, Inc. (800) 473-5298 Distributed in IN by Environmental Septic Solutions (812) 457-3144

**System Owner:** \_\_\_\_\_ **Site Address:** \_\_\_\_\_

**Instructions to Installer: Check box in left column to confirm each installation requirement has been met. After completion, provide a copy of this form to Designer, System Owner and Local Health Officer.**

√	INSTALLATION REQMTS.	COMMENTS	REFERENCE
	Installation performed during appropriate weather conditions	Not installed on wet or frozen ground; protect against freezing; system covered with System Sand and cover material immediately after inspection.	Revised Sect. E, 3/2007, p. 19
	Proper site preparation before installation	No heavy equipment on system area and dispersal area; no scraping, compacting or smearing of receiving soils; excavated using toothed bucket only; organics removed. <b>Elevated systems:</b> till 7-14 in. deep, parallel to contour; install 6 in. System Sand, mix to create transition layer. <b>Subsurface systems:</b> rake furrows 2-6 in. deep w/ toothed bucket in entire bed area.	Revised Sect. E, 3/2007, p. 18-20
	Trees/Stumps in system location	Use mechanical "thumb" to minimize soil disturbance. Fill voids with System Sand. <b>Elevated systems:</b> remove all stumps 3 in. or larger, cut stumps less than 3 in. flush w/ original grade. <b>Subsurface systems:</b> remove all stumps/roots below grade.	Revised Sect. E, 3/2007, p. 21
	Correct System location	Confirm elevations and set-backs per plan; not located where surface or ground waters converge; designed and installed along contour; note any discrepancies or changes approved by local health department on "as built" plan; sketch system location on sheet provided, making reference to structures or benchmarks and indicating any "as-built" changes; provide copy of sketch to system owner.	Manual p. 11, p. 14
	System Sand meets specs.	IN DOT Specification 23 OR ASTM C-33 w/ less than 2% fines	Manual, p. 13
	Correct Amount of System Sand installed	6 in. below pipes ( <b>if subsurface</b> ) 12 in. below pipes ( <b>if elevated</b> ) 6 in. minimum between rows 6 in. above pipes 12 in. horizontally beyond ends of pipes Incorporate System Sand extensions if req'd 6 in. deep in System Sand extensions	Manual, p. 13
	Offset Adapters installed correctly	Hole in the 12 o'clock position	Manual, p. 7
	Raised Connections installed correctly	Extend no less than 2 in. and no more than 4 in. into pipes; angled so that top of Connection is level with top of pipe.	See Training Update 12/09 & Details
	Alignment of Enviro-Septic® pipes is correct	Approximately parallel (to within +/-1 in.) and level (to within +/- ½ in.)	Manual, p. 15
	D-Box installed correctly (if used/required)	On stable base; level; flow equalizers installed and adjusted; unused outlets plugged/mortared; seals watertight; minimum 2 in. drop in elevation from d-box to Enviro-Septic® pipes; tee baffle required in d-box	Manual, p. 16, p. 27
	Septic Tank installed properly	Sized sufficiently in relation to daily design flow; watertight; inlet and outlet baffles in place; all access covers, risers, etc. sealed; connecting PVC from tank to d-box or pipes slopes at least 1%.	Manual, p. 16 Also see Training Update 12/09
	Observation Port installed properly	One observation port req'd. at center edge of each bed, on downslope side if sloped; constructed of PVC, capped, wrapped in geotextile fabric; bottom of PVC at the infiltrative surface.	Manual, p. 11 Revised Sect. E, 3/2007, p. 17

✓	INSTALLATION REQUIREMENTS	COMMENTS	REFERENCE
	Perimeter drain properly installed (if needed to lower SHWT)	Must encircle system completely on 4 sides; constructed of perforated minimum 4 in. approved drain pipe w/ geo-textile sleeve when required; located at least 3 ft. below infiltrative surface; minimum 10 ft. from outer edge of System Sand bed(s); aggregate to w/in 6 in. of final grade; installed with a positive slope of at least 0.2 ft. per 100 ft. with no sags in the line. Side-to-side beds require segment drain between beds; instruct system owner not to alter swales & explain importance of ongoing maintenance to ensure outlet is unobstructed.	Manual, Revised Sect. C Also see Training Update 12/09 & Details
	Venting Properly installed (if required)	Venting is REQUIRED for all systems. High vent off the d-box is required for flood dosed systems, 10 ft. differential req'd. between low & high vent inlets. House/roof vent will be "high" vent in gravity systems. Low vent inlet to be min. 3 ft. above final grade. One 4 in. vent req'd. for every 500 ft. of pipe.	Manual, Section I, Venting pp. 37-39.
	No excess hydraulic loading	NO floor drains, roof drains, foundation drains, sump pumps, gutter systems, irrigation systems, etc. discharging in system area.	Manual, p. 14 See Training Update 12/09
	Discharges from water treatment systems, water softeners/purifiers, hot tubs, jetted tubs, etc.	Unless the system's daily design flow was calculated to include discharges from such appliances, seek an alternative means of dispersal.	See Training Update 12/09
	Sufficient cover material installed	Minimum 6 in. compacted loam (topsoil) capable of sustaining vegetative growth; immediately mulch/seed to prevent erosion. NO pavement or other hardscape above system; no trees w/in 10 ft. of system; plant only grass or wildflowers.	Manual, p. 14
	Cover material crowned	Crown from the center to direct surface water flows away from the system; minimum 3% finish grade slope.	See Training Update 12/09
	Surface diversions ("Swales") properly constructed	Located to intercept and divert surface water away from the system; located in undisturbed soil; min. 10 ft. away from bed (if no perimeter drain) or above/upslope of perimeter drain with a minimum positive slope of 0.2 ft. per 100 ft.; instruct system owner not to alter or remove swales.	See Training Update 12/09
	Cover extensions ("side slopes") properly installed	Req'd. if top of System Sand bed is above original grade; slopes 10% or less require 3 ft. extension beyond pipe in all directions before tapering; slopes greater than 10% require 5 ft. cover extension on down-slope side before tapering; tapering to be 3:1 or shallower.	Manual, p. 12, p. 13
	Flood Dosing schedule	Adjust pumps so that pumping frequency is a minimum of design flow ÷ 6 maximum of design flow ÷ 8 per day.	Manual, Section H Flood Dose System Requirements, p. 36.
	System Installation Form	Completed and mailed to Presby Environmental.	Manual p. 4
	Use & Care Instructions	Provide System Owner with Use & Care Instructions and copies of completed worksheets. Inform System Owner of availability of manual @ <a href="http://www.presbyeco.com">www.presbyeco.com</a> .	Visit our website

***By signing below, I confirm that I have followed the installation guidelines set forth above, I have received a completed Design Worksheet, and I have provided a copy of this completed form to the system owner, the designer and the local health officer:***

Installed by: \_\_\_\_\_  
(Print Name)

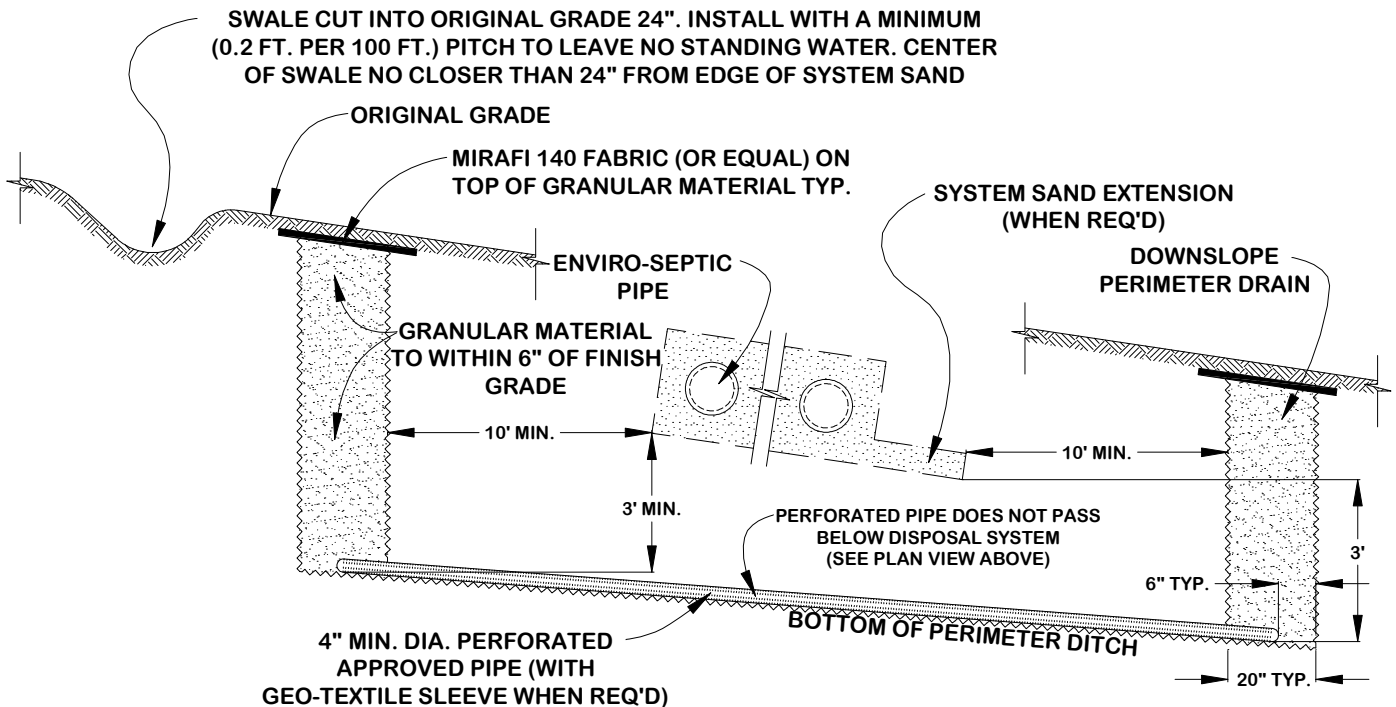
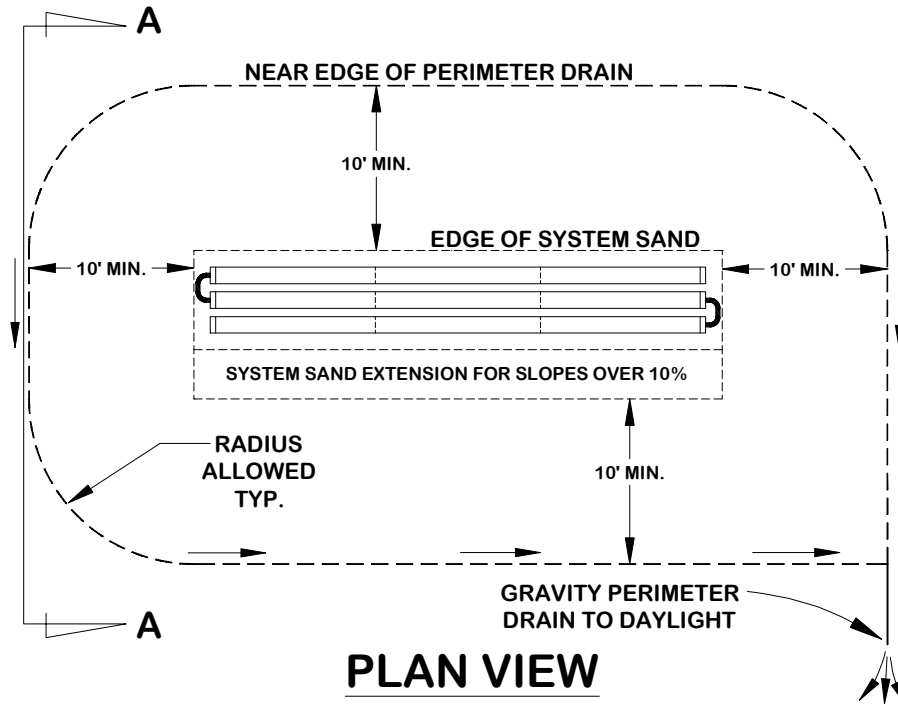
Date(s) of Installation: \_\_\_\_\_

Signed: \_\_\_\_\_

PEI Certification Number: \_\_\_\_\_

## PERIMETER DRAIN NOTES:

1. DRAINS INSTALLED WITH A MINIMUM (0.2 FT. PER 100 FT.) SLOPE TOWARD DRAIN OUTLET.
2. SYSTEM IS NEVER DESIGNED TO ACCOMMODATE ADDITIONAL WATER FROM FOUNDATION OR FLOOR DRAINS, ROOF GUTTERS OR SURFACE WATER. FINISH GRADING SHOULD DIRECT SURFACE WATER AROUND AND AWAY FROM FIELD.
3. SIDE-BY-SIDE CONFIGURATION REQUIRES A SEGMENT DRAIN BETWEEN THE BEDS. BED SEPARATION IS 20' PLUS THE WIDTH OF THE DRAIN.

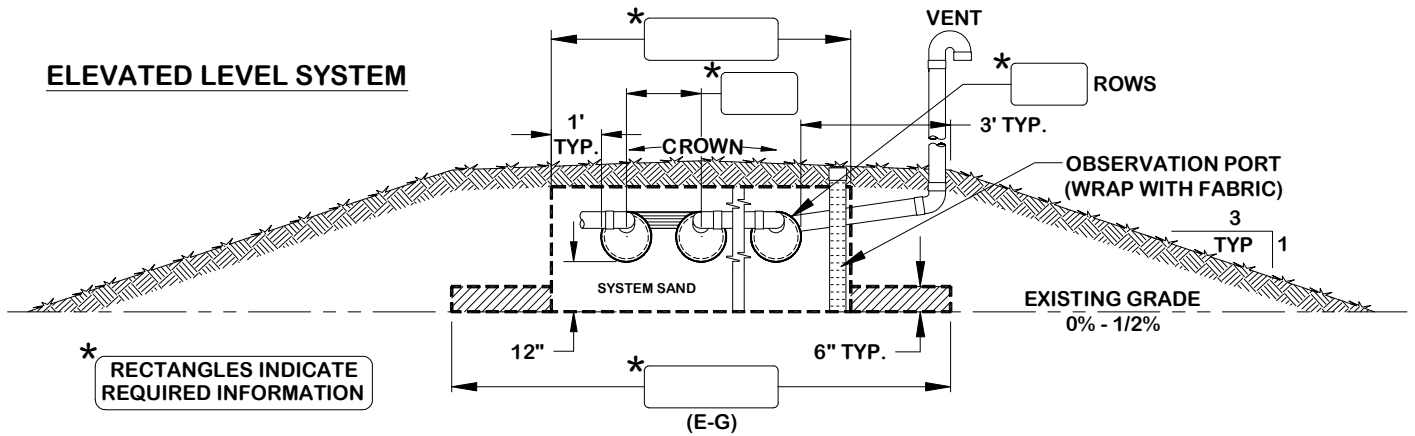


**SECTION VIEW A-A**  
LEVEL OR SLOPING SYSTEMS

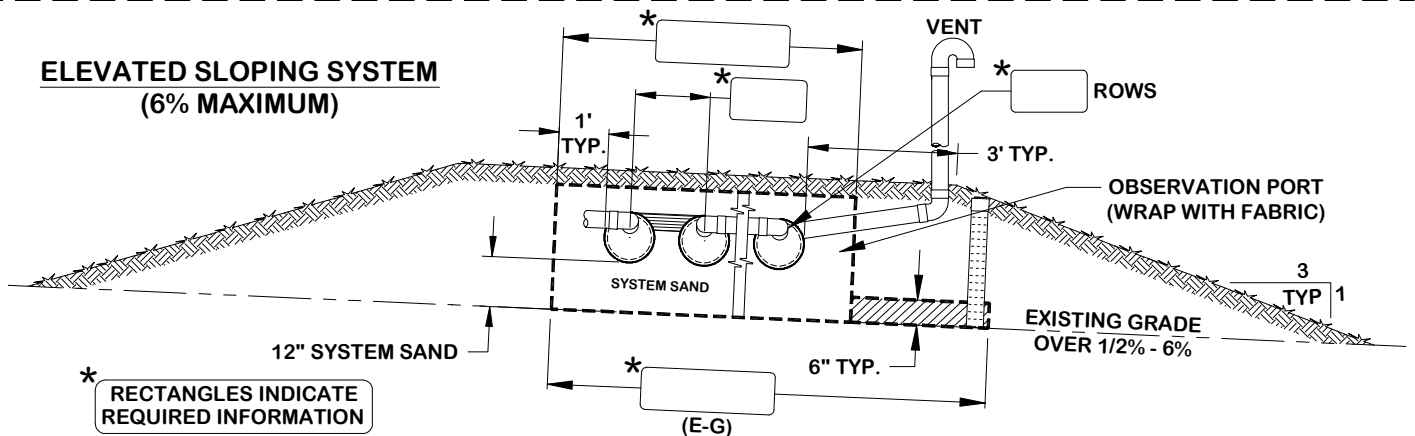


# CHOOSE CROSS-SECTION THAT APPLIES AND PROVIDE REQUIRED INFORMATION

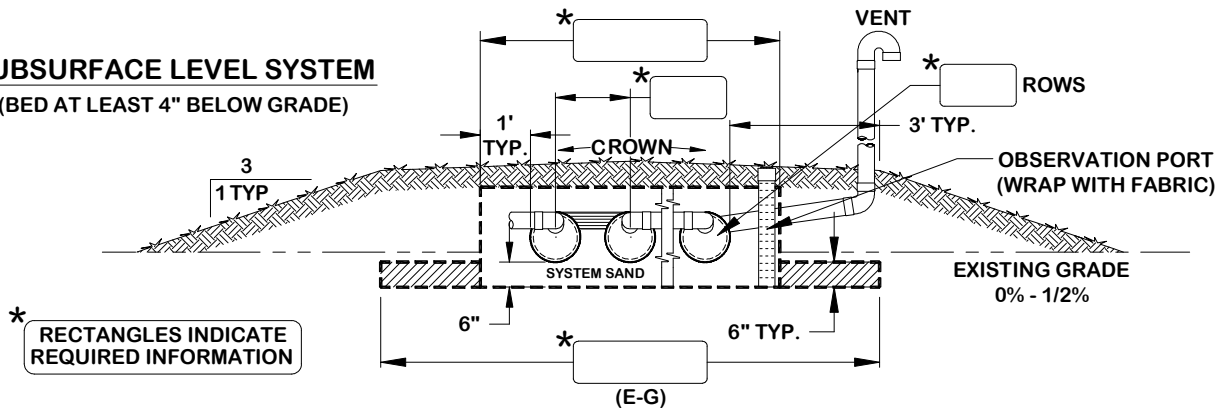
## ELEVATED LEVEL SYSTEM



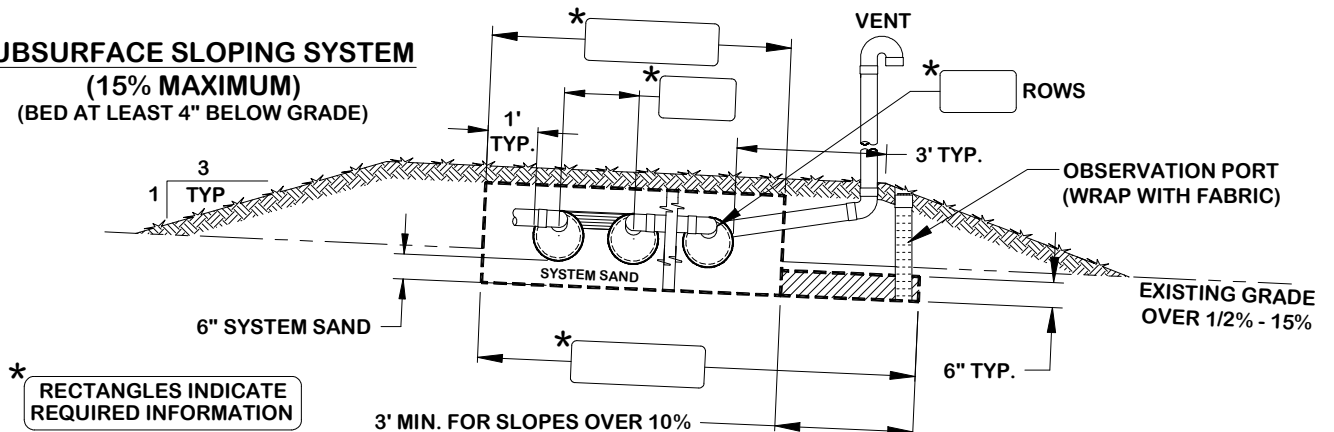
## ELEVATED SLOPING SYSTEM (6% MAXIMUM)



## SUBSURFACE LEVEL SYSTEM (BED AT LEAST 4" BELOW GRADE)



## SUBSURFACE SLOPING SYSTEM (15% MAXIMUM) (BED AT LEAST 4" BELOW GRADE)





# PRESBY ENVIRONMENTAL, INC.

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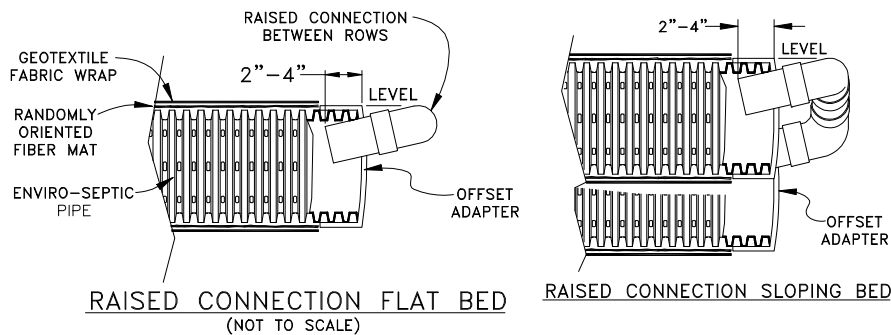
143 Airport Rd., Whitefield, NH 03598  
Tel: 1-800-473-5298 Fax: (603) 837-9864  
www.presbyenvironmental.com info@presbyeco.com

**TO:** All Indiana Designers & Installers of Enviro-Septic® Systems:  
**FR:** Presby Environmental, Inc. and Environmental Septic Solutions, Inc.  
**RE:** Training Update, Correct Installation of Raised Connections & Tee Baffles  
Issued December, 2009

**PLEASE NOTE:** The details and Installation Notes regarding Raised Connections below were inadvertently omitted from Revised Section E dated March 2007, p. 21 of our manual. Proper installation of the Raised Connections is important to maintaining the proper liquid depth in the pipes and achieving even distribution among the rows. If the Raised Connections are not installed properly, this could also interfere with the flow of oxygen through the system.

## Installation Notes for Raised Connections:

- 1) Insert PVC a minimum of 2 in. and a maximum of 4 in. into the offset adapters. Inserting the PVC more than 4 in. could cut off the flow of air through the system. If the PVC does not extend at least 2 in. into the offset adapter, they may become dislodged during backfilling.
- 2) Install the Raised Connection so that the top of the 90° elbow is level with the top of the of Enviro-Septic® pipe as shown in the drawings below.
- 3) Pack sand under and around the raised connection to prevent movement, settling or shifting. Take care during backfilling procedures not to dislodge the Raised Connections.



**ALL systems are required to have a Tee Baffle in the d-box. See detail below:**

